DOCUMENT RESUME

ED 157 359 EC 111 876

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TITLE An Environmental Sensing, Selection, Evaluation and Training System for the Blind.
INSTITUTION Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
PUB DATE Jun 78
GRANT G007604405
NOTE 10p.; Paper presented at the World Congress on Future Special Education (First, Stirling, Scotland, June 25 - July 1, 1978)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Blind; *Electronic Equipment; *Research Projects; *Travel Training; Visually Handicapped; *Visually Handicapped Mobility

ABSTRACT

The paper reports on a study aimed at developing: (1) a compendium of environmental sensing skills and behaviors, (2) a set of selection procedures and performance trials for matching blind candidates with electronic travel aids, (3) a standard evaluation of pre- and post-training performance, and (4) training guidelines. The materials are noted to comprise the ESSETS (Environmental Sensing, Selection, Evaluation, and Training System) package. (Author/SBH)

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ED157359

Revised version 7/28/78

AUG 1 1978

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AN ENVIRONMENTAL SENSING, SELECTION, EVALUATION AND TRAINING SYSTEM FOR THE BLIND

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World Congress on Future Special Education
June 28, 1978
Stirling, Scotland

The research reported herein was supported by the Bureau of Education for the Handicapped, U.S. Office of Education, under Grant No. G007604405. Opinions expressed do not necessarily reflect official position or policy.

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Abstract

AN ENVIRONMENTAL SENSING, SELECTION, EVALUATION AND TRAINING SYSTEM FOR THE BLIND

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With support from the Bureau of Education for the Handicapped, the American Institutes for Research is engaged in a study aimed at developing, respectively, 1)a compendium of environmental sensing skills and behaviors, 2) a set of selection procedures and performance trials for matching blind candidates with electronic travel aids, 3) a standard evaluation of pre- and post-training performance, and 4) training guidelines. All of these materials comprise the ESSETS package, which stands for Environmental Sensing, Selection, Evaluation and Training System. Following field testing, revised versions will be available in late fall, 1978.

Background of the Problem

In many ways, technology holds great promise for helping blind persons to function more fully and more independently. Among the newer, especially challenging areas in which technology has been put to use is in the area of increased freedom of movement for the blind. Over the last several years a variety of environmental sensing devices have been developed by various organizations in England, the United States and New Zealand. These can be generically referred to as ETA's or Electronic Travel Aids.

This paper will report on work undertaken by the American Institutes for Research (AIR) in Palo Alto, California, in connection with a grant from the Bureau of Education for the Handicapped. The primary emphasis of this work has been an analysis of the processes of environmental sensing by blind persons and the development of easily implemented procedures for assessing this skill when secondary and college aged blind students are being taught to use ETA's.

ETA's included in the AIR project were:

- The Sonicguide, a binaural ultrasonic device that is worn in a manner similar to eyeglasses and which produces audible signals. It was developed by Wormald International Sensory Aids in New Zealand, and is distributed by Telesensory Systems, Inc. in the United States.
- The Mowat Sensor, a small hand-held ultrasonic device which produces tactile, vibratory signals. It too was developed by Wormald and is distributed by Telesensory Systems.

- The Pathsounder, a chest-worn sonar-type travel aid which gives auditory and vibratory signals to a wearer. It was developed and is marketed by Lindsay Russell in the United States.
- The Laser Cane, a long cane with three built-in laser beams which probe the environment and which produce audible as well as vibratory signals. It was developed and is marketed by Bionics, Inc. in the United States.
- The Nottingham Obstacle Detector, a small, held-held ultrasonic device that produces audible signals. It was developed and is marketed by the Blind Mobility Research Unit, University of Nottingham, England.

Project Goals

As one might expect, there is no ideal device that is appropriate for all blind persons. This is partly due to design properties and limitations of the different devices and the way that these design properties interact with different environmental variables, and it is partly due to the many individual differences among blind persons themselves. These differences reflect not only the nature and extent of their vision loss, but also their varying interests and life goals. AIR takes the viewpoint that individual differences are important, and maintains that technology is best designed and best used if it complements and capitalizes upon the individual's capabilities, interests, and functional needs. Accordingly, we feel that it is appropriate to give increased attention to the task of matching persons with devices so that any natural or pre-existing capabilities can be maximized.

Realistically, each developer, manufacturer, and vendor can be expected to promote their own product on the marketplace, and, understandably, orientation and mobility instructors and rehabilitation counselors tend to favor particular devices. Consequently, there is a clear-cut need for a consumer-oriented objective procedure by which blind users can be matched to devices which best suit their needs.

Similarly, few would dispute the notion that thorough evaluation of a blind person's performance is essential to determine what skills have actually been learned as a result of training. Somewhat fewer people recognize the importance of evaluating a blind trainee during the training process. Still fewer persons systematically evaluate trainees before and after training according to objective criteria which are applied in a consistent, equivalent way to each trainee, thus enabling an overall appraisal of the effectiveness of the training itself. Moreover, until now, there has been no attempt to develop standard performance exercises that could be implemented at different training locations, thereby enabling meaningful comparisons of alternative training approaches. Clearly, then, there is a need for standards of performance assessment that are informative to trainees, meaningful to trainers, and which offer the prospect of interpretable information to researchers as well as helpful feedback to equipment developers.

Finally, few would deny that the training of blind persons to function effectively in the environment requires a very personalized approach to instruction. Orientation and mobility instructors, like researchers, are unable to state with certainty what should be taught to

a given individual. As a result, instruction becomes largely intuitive, and there is a corresponding risk that some important factors for a particular individual may be overlooked during training. In fact, the tasks inherent in environmental sensing are so complex, overlapping, and subject to situational variation that it is often hard to describe in detail what is really being emphasized in a training course. This suggests the need for a conceptual framework of environmental sensing skills and behaviors such that instructors and researchers can more carefully delineate what has and what has not been included in a particular course of instruction, and whether the training has had direct relevance to the trainee's daily needs and personal goals.

Description of the AIR Project

Under Veterans Administration sponsorship for one year, followed by Bureau of Education for the Handicapped sponsorship for two years, AIR has been engaged in the development of a prototype system for addressing the several needs areas just described. More specifically, we have developed a four-part system, of which the first component is entitled Environmental Sensing: Reference Compendium. It is organized into eight topical areas with an accompanying glossary and index. The eight topical areas are presented in the order of their increasing complexity and proficiency. They include:

1. Relating Body-Image and Surrounding Space
2. Perceiving and Defining the Environment
3. Relating Personal Movement to Environmental Factors
4. Relating Personal Movement to Distance, Time, and Rate

5. Compiling a Cognitive Map

6. Planning, Executing, and Assessing Travel Routes

7. Optimizing Travel Performance

8. Analyzing Personal Attributes for Greater Independence

The second component of the system is entitled Environmental Sensing: Selection and Matching. It is organized in two parts. Part A emphasizes selection of trainees according to:

- Physical/Medical Factors
- Internal Motivations
- External Influences
- Cost Considerations
- Readiness Assessments

Part B emphasizes appropriate selection of an ETA that matches best with the trainee. It consists of a series of Matching Trials for each of the five devices named previously.

The third component of the system is entitled Environmental Sensing: Evaluation of Attained Performance. It involves a series of standard exercises that differentiate existing skills from skills which should be emphasized during training, and provides a way to contrast an individual's performance before and after training with ETA's. It should be emphasized that the standard exercises are designed so as to be readily implemented at different training sites.

The fourth component of the system is entitled Environmental Sensing: Training Guidelines. It involves sample lesson plans and general procedures for developing instructional strategies that build upon the information

obtained through the selection and matching component and the evaluation component just described. The training guidelines emphasize cooperative goal setting by the trainee and the instructor.

Ms. Carla de Haas, an Associate Research Scientist on AIR's staff and a certified instructor in the use of ETA's, has played a key role in the development of the present version of these materials. Taken together, the four components in this system comprise what we call the ESSETS approach. ESSETS stands for Environmental Sensing, Selection, Evaluation and Training System.

Current Status

These prototype materials have been reviewed and field tested at training centers in South Carolina, Georgia and Arizona. By October of 1978 these materials will have been revised and be available for distribution to any organization that expresses interest in adopting the ESSETS approach. In the long run, we hope to develop a coordinated network of future adopters of ESSETS who will be willing to share information on trainee/ETA performance which promises to benefit blind individuals.

We have established a prototype system that has been demonstrated to be workable in the field, and which is readily understood and implemented by orientation and mobility instructors who have been certified to teach the use of electronic travel aids. At present, ESSETS materials are primarily for use in training programs for persons who lack useful travel vision. We recognize the desirability of adapting these or developing similar materials to serve the environmental sensing needs of the many persons having partial vision.

As we look to the future, AIR is hopeful that the use of ESSETS materials at various training sites will result in evaluation information that is immediately useful both to the trainee and the instructor. It should also permit more meaningful communication across training sites, as well as evaluation of new devices that is based on more substantial numbers of persons than are typically available to equipment developers or researchers at any one location. We invite inquiries from interested schools, colleges and rehabilitation training facilities as to the availability of the ESSETS materials in the fall.